

# **KEKB experience with Power PC IOC**

presented by

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for

**EPICS collaboration meeting**

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# Power PC IOC in KEK

## Force Power Core 6750

- Power PC750 233MHz
- 64 MB memory
  - ▶ the version of VxWorks we use does not support a code segment beyond 32MB area.
  - ▶ We just uses area above 32MB for data

# Power PC performance

## Marty's Database for Bench Marking

- 300 CALC records are process at every scan

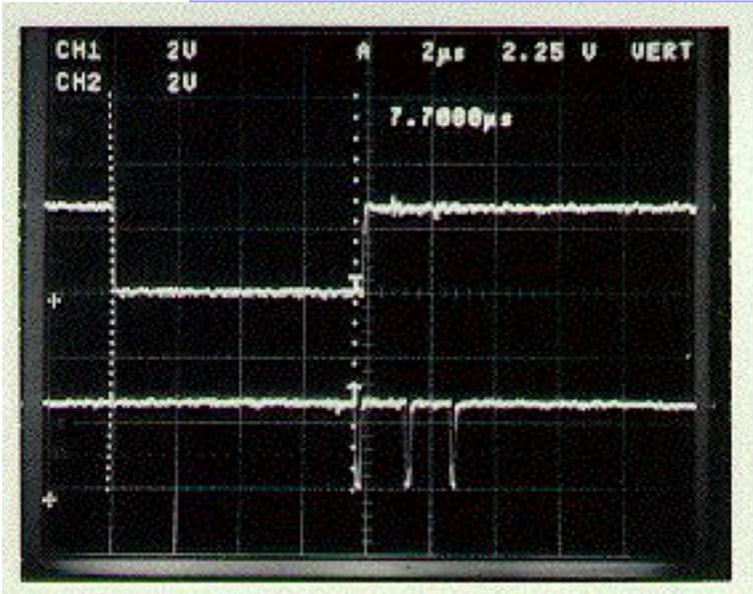
SCAN period	MC68040@25MHz	PPC604@100MHz
1 sec	5.8 %	1.1 %
0.5 sec	12 %	2.1 %
0.2 sec	27 %	5.6 %
0.1 sec	56 %	12 %

**CPU usage of SCAN task on IOC**

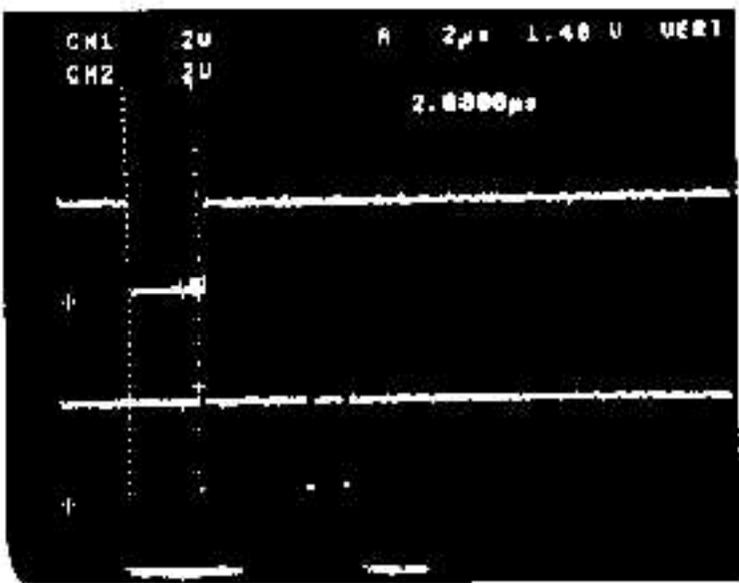
# Interrupt latency

Interrupt

DTACK



Power PC 604/100 MHz

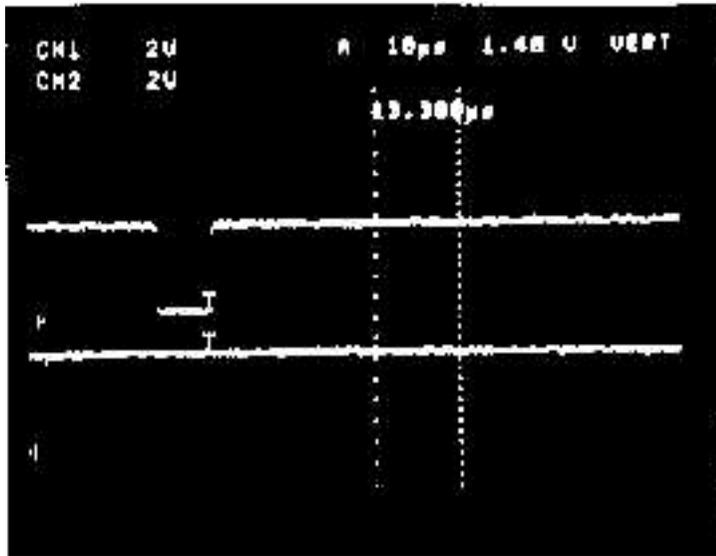


MC68040/25MHz

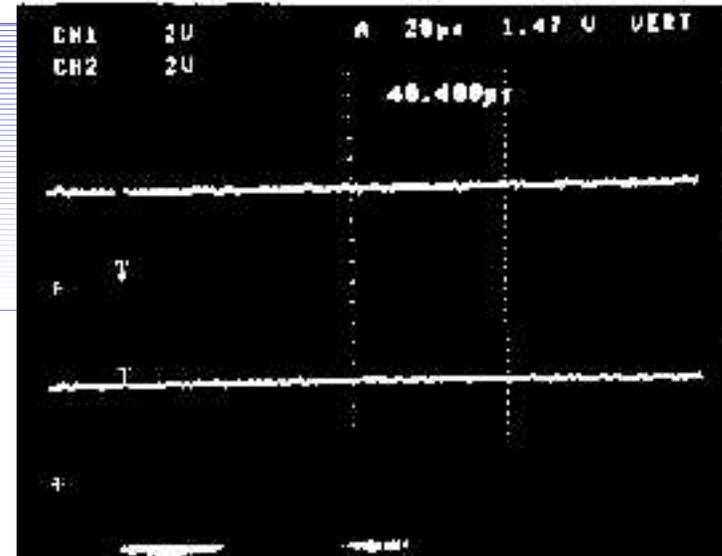
# Record Processing

Interrupt

DTACK



Power PC 604/100 MHz



MC68040/25MHz

	PPC	MC68040
Interrupt	7.7 µsec	2.1 µsec
ISR	9.3 µsec	5.4 µsec
First Record	35~50 µsec	70~105 µsec
Second Record	13~18 µsec	48~54 µsec

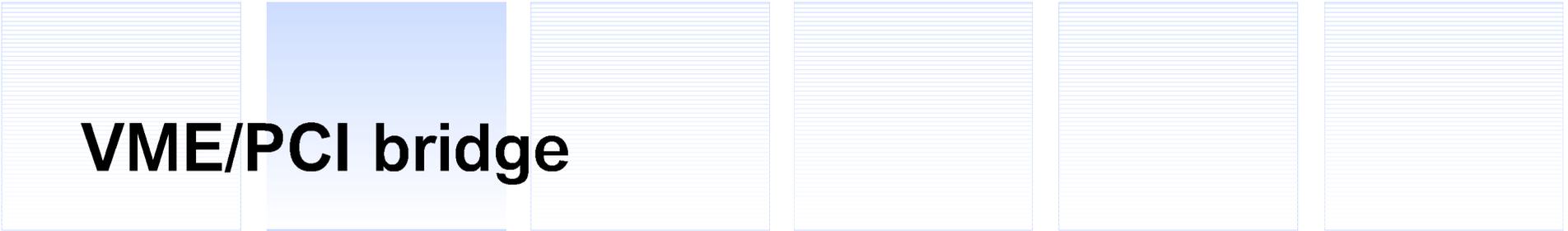
# EPICS port

## Compiler

- **signed/Unsigned -> -fsigned-char**
- **Global Name does not have "\_" -> EPICS in R3.13**
- **va\_list type difference -> solved in EPICS R3.13**
- **data alignment of short. -> data structure of GP-IB driver was modified.**

## VxWorks(Force PPC board Specific (?))

- **No intHandlerCreate() function**
- **vxMemprobe always returns OK in write mode. -> need to specify number of boards in startup script.**
- **slave A24 support -> needed to modify BSP code.**



## VME/PCI bridge

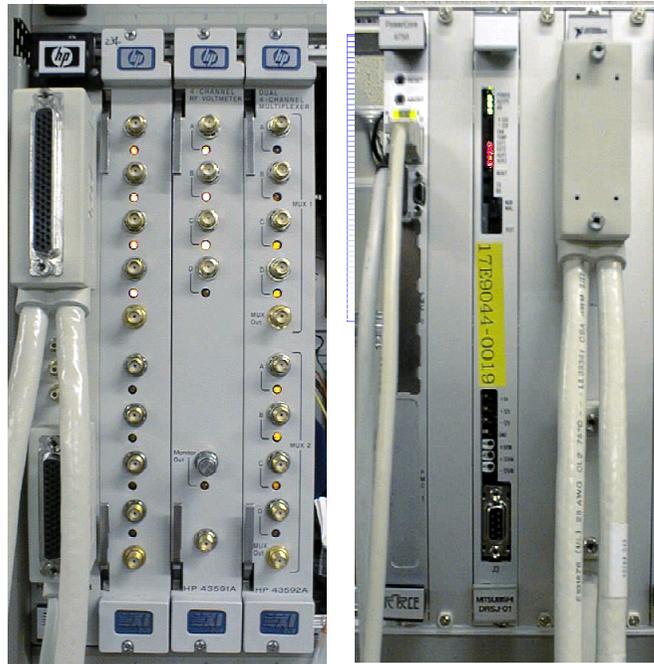
**The first version of Universe Chip(VME/PCI bridge) had a bug.**

- After normal completion of interrupt cycle, Universe chip starts IACK cycle again without any Interrupt source.
- causes
  - VME Bus Error on IACK level 5
  - message on the console
- Fixed in Universe II
- Patches were applied to old boards

# FP exception handling

- ▶ Floating Exception suspends the process
- ▶ It is also safe to add `VX_FP_TASK` Flag when you spawn new task to save/restore FP registers at context switches.

# VXI/MXI/VME in Beam Position Monitor system



## Beam Position Monitor System

### ■ VXI

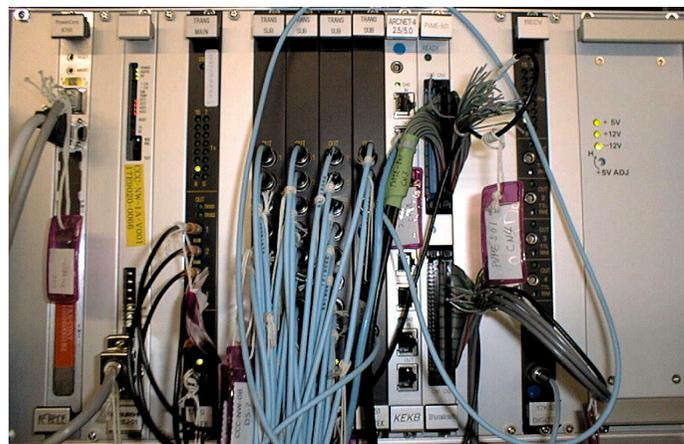
- ▶ HP 43591A : 4Ch RF voltmeter
- ▶ HP 43592A : Dual 4ch signal multiplexer
- ▶ HP VXI-MXI

### ■ VME

- ▶ IOC Force Power Core 6750
- ▶ HP/NI VME-MXI

### ■ Event Timing for Synchronized Operation

### ■ 800 BPMs 20 IOCs



## The problem

- ▶ Normally BPM system is running continuously.
- ▶ Occasionally one of 20 IOC stops during this operation.
- ▶ No indication of software error.
- ▶ VME backplane/configuration in VME chassis affects rate of failure.
  - ▶ Putting VME bus extender reduced rate of failure on some IOC dramatically.
- ▶ Some IOC stops more often than others.
- ▶ No yet identified the source of this failure
- ▶ Use of faster IOC (Power Core 6750@400MHz)

# WE7000 Series from Yokogawa Electric

## What is WE7000

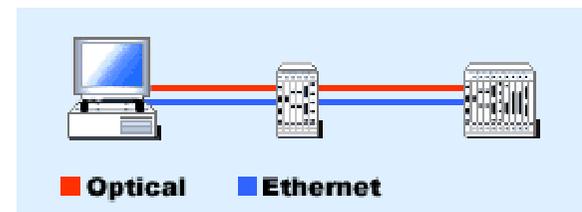
- PC-Based Measurement Instruments developed by Yokogawa Electric Corporation, JAPAN.
  - ▶ Various modules for Test-and-Measurement
  - ▶ Control software running on PC(MS Windows)
  - ▶ Optical, Ethernet or Serial Link between PC and WE station.

KEK-JAERI Joint Project will use WE7000 for its Measurement Station (mainly for digital Oscilloscope).

- EPICS device support for WE7111/7121 (100M sampling/sec 8bit) were developed.
- Development of a device support for WE7275/7271 (1MS/sec 14/16 bits), is under consideration.

PC-Based Measurement Instruments *WE7000*

[Product Info](#) | [Support](#) | [Applications](#) | [Spec](#) |



- **Modular Design for Easy Configuration**
  1. Simple installation
  2. No programming necessary
  3. Plug & play architecture
- **Three methods of communications**
  1. An optical fiber cable provides a connection that is noise resistant
  2. Easy Ethernet configuration
  3. Serial interface can be easily connected.
- **Windows-based control software**
- **High precision modules with traceability**
- **Easy installation and removal**

## What's New

- \* **WE7000 Control Software** (included, PDF, 273 K)
- \* **Easy Ethernet network configuration**
  - An IP address is automatically assigned when using the DHCP server on the LAN.
  - Enables communication between the measuring station and the PC which is not in the same segment.
- \* **Compatatibility with Windows 2000 Pro**
- \* **1 GS/s Digital oscilloscope module WE7311**



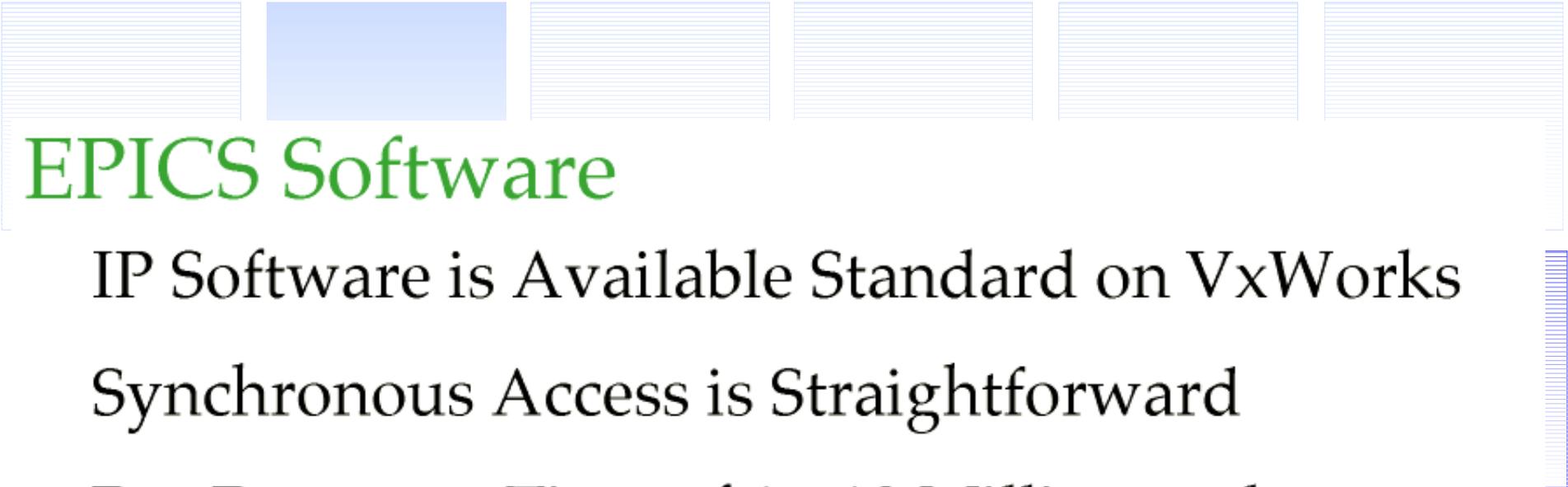
- Max. sampling rate 1 GS/s, 8-bit resolution
- 400 MHz analog bandwidth (real time sampling only)
- Max. memory 2 Mwords
- Sequential store function
- Compatible to both the oscilloscope mode and the digitizer mode.
- The WE7311 modules in adjacent slots can be synchronized (Max. 8 ch) for measurements.
- [Specifications](#) (PDF 125 K)

### \* **Fast Ethernet Module WE7052**



- Compatibility with the 100Base-TX
- Initial settings are simplified by using the Auto Negotiation and the DHCP functions on the LAN
- [Specifications](#) (PDF 77 K)

Note that the WE7000 is currently only on sale in the United States, the United Kingdom, Germany, France, the Netherlands, Spain, Italy, South Korea and Japan.



## EPICS Software

IP Software is Available Standard on VxWorks

Synchronous Access is Straightforward

But Response Time of 1 - 10 Milliseconds

EPICS do not Allow This

Asynchronous Version should be Developed

First, Test Implementation on Unix

Then, to VxWorks